

A Canadian LCA database: Challenges and opportunities

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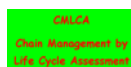
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ecoinvent - a global success story ...

- more than 1500 customers use ecoinvent data in more than 40 countries
- data are embedded and/or importable in all major LCA software tools

- SimaPro
- Umberto
- Team
- CMLCA
- GaBi
- KCL-Eco
- Regis
- Emis
- Green-e



KCL-ECO



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... used in more than just LCA tools!



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- Waste management policy in communities:
Wrate (Environment Agency, United Kingdom)



- Environmental assessment of products:
BilanProduit (ADEME, France)



- Environmental assessment of buildings:
LEGEp, Germany
OGIP, Germany
VITRUVIUS, Switzerland



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The ecoinvent database v.2.0



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- More than 4000 generic LCI process datasets on energy supply, resource extraction, material supply, chemicals, metals, agriculture, waste management services, and transport services
- Online access to LCI and LCIA results for all datasets
- Based on industry data, compiled by independent experts
- Consistent, validated and transparent
- Continuously maintained
- International in scope, including e.g. data on US agriculture, worldwide sourcing of raw materials and production of electronics in Asia

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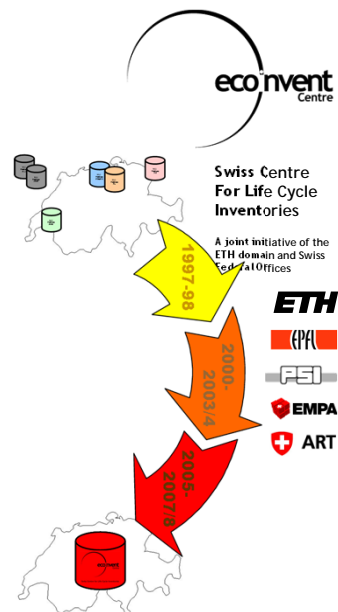
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History

- Before 1996: Different institutes (ETH, ...), each with their database
- 1997-1998 / **Pilot project**: system specification and first draft version of quality guidelines
- 2000-2004 / **Project „ecoinvent 2000“**:
 - finalisation of ecoinvent quality guidelines
 - establishing the database ecoinvent v1 (~ 2700 unit processes)
- 2005-2008 / **Project ecoinvent v2**:
 - update and extension of ecoinvent database from v1 to v2 (~4'000 unit processes)

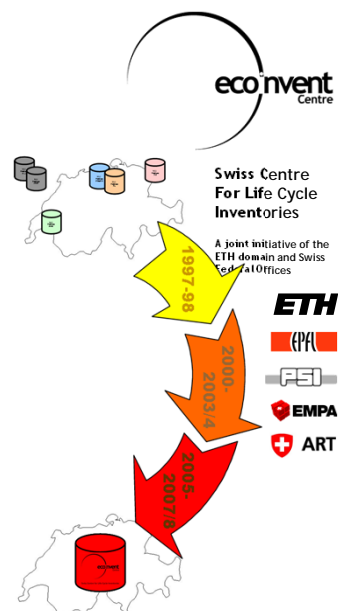


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Succes factors

- Long-term tradition in LCA and LCI data supply
- Large LCA society
- Willingness to co-operate and find consensus on LCI methodology and format
- **Memorandum of Understanding**:
 - Join forces
 - Focus on key competences
 - Long-term engagement
- Financial support



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Possible business models

Database administration, review process, development:

- Project funding (government, institutes)
- Licenses
- Pay-per-view
- Open Access sponsors
- International co-operation reduces costs

Data collection:

- will always need to be externally funded or voluntary

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Unit process data ...

... indispensable for relevant LCA research and consulting

Technology Assessment:

- long time horizon
- supply mixes change over time
- need to adapt existing data to future situations

Regional background databases:

- different environmental legislation
- different supply mixes
- need to adapt existing data to regional situations

Transparency allows case-dependent Data Quality Assessment

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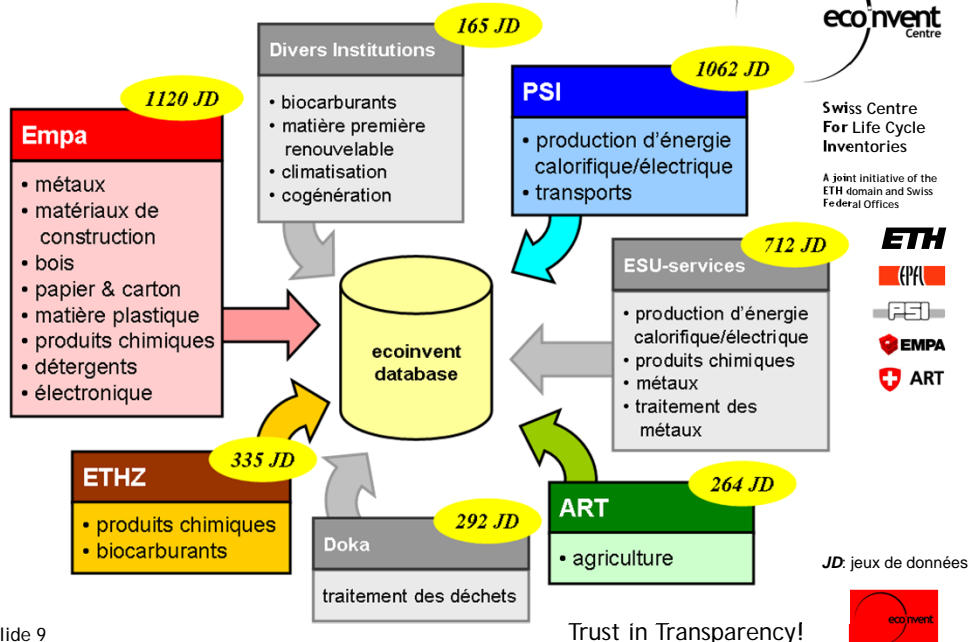
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La base de données v. 2

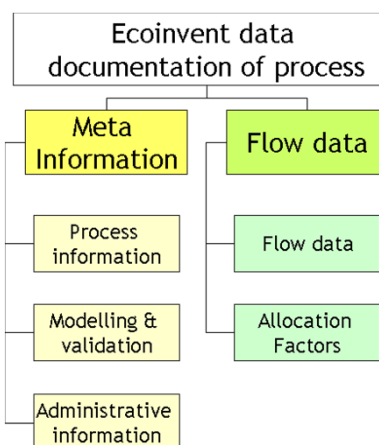


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EcoSpold data(exchange)format

- XML-format
- Compliant with ISO/TS 14048
- Enables:
 - extensive documentation
 - individual determination of allocation factors
 - confidential data management (if required)
- Data format used for
 - LCI raw data,
 - LCI results,
 - LCIA results, and
 - LCIA methods (characterisation & damage factors)



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EcoSpold data(exchange)format

- Open source => EcoSpold public licence
- Facilitates communication between LCA practitioners
- Working, widely applied and accepted
- Import (partly export) interface implemented by major LCA software providers: SimaPro, Umberto, GaBi, Team, KCL-eco, CMLCA, Regis, Emis

LCA data in EcoSpold format:

- USA LCI database
- Australian LCA database
- ecoinvent database
- European projects

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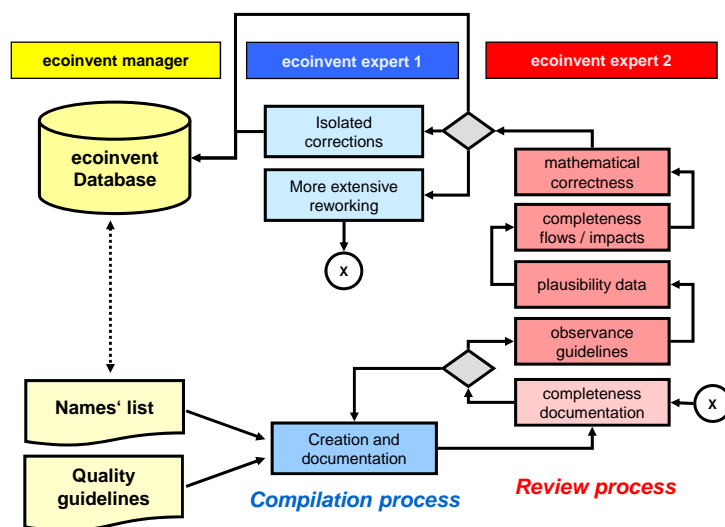
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Data compilation & quality assurance



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International editorial board and broader supplier base

- International editorial board
 - Activity editors, for each industry activity and for household activities
 - Cross-cutting editors, to ensure consistency and monitor developments across the entire database, both for specific (groups of) emissions, for geographical areas, scenarios, etc., and for the meta-data fields, e.g. uncertainty
- Broader supplier base
 - Making it easier for experts and lay users to contribute with new data or corrections to existing data
 - All such contributions still subject to strict quality control, review, and validation procedures before entering into the database



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The ecoinvent offer to national database initiatives

- National initiative is responsible for their own local data collection programme, and retains the right to license the collected data to third parties, while providing the collected data for publication in the ecoinvent database
- ecoinvent provides the necessary infrastructure for validation and publishing of the data as part of the ecoinvent database
- Free ecoinvent licenses to all active in the national initiative
- Both sides can terminate the co-operation with one years notice to the end of a calendar year.



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Parameterisation

- Geographical parameters:
 - Core international datasets + national differences
 - Using GIS coordinates, all other area parameters can be expressed: Country codes, areas with different population densities, habitat areas, watershed areas, etc. for site-dependent impact assessment
- Temporal parameters (years)
- Scenario parameters (e.g. BaU, optimistic, pessimistic)
- Dataset-internal parameters



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Preparing for integration with supply-use data

- Link to monetary and physical supply-use tables
 - Ensures completeness of process database
 - Allows easier production of national versions
 - Opens up for new applications: LCC, Material Flow Analysis



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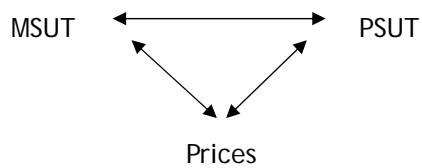
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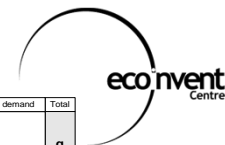


Monetary and physical supply-use tables

Balanced MSUT	Activities (a_{ij})	Products (c_{ij})	Export	Total
Activities (a_{ij})		V		g'
Products (c_{ij})	U		E	q
Import		N'_V		
Primary inputs	Labour and profit			
Total	g	q'		



Balanced PSUT	Activities (a)	Products (c)	Final demand			Total
Activities (a)		V				g
Products (c)	U		y	E_c	E_w	q
Import		N'_c				
		N'_w				
Stock changes	$-\Delta S$					
Supply of residuals	$-W_V$					
Use of residuals	W_U					
Resources	R					
Emissions	$-B$					
Water balancing	Q_{H2O}					
Total	g^*	q'				



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Supply-use framework ensures completeness

- All economic activities in society are covered, i.e. the sum of all activities = national output
- Per process/industry, all monetary inflows are traced to monetary outflows (intermediate inputs or value added), i.e. no upstream cut-offs
- Per product/commodity, what is produced must be used, i.e. ensuring complete product balances across the economy



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Easier production of national process databases

- Most countries produce monetary supply-use tables annually, which can serve as a basis for consistent national versions of the core ecoinvent database
- This may then be supplemented by specific national process data



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Supply-use framework opens up for new applications of the database

- Life Cycle Costing (LCC):
 - Consumer spending always ends up as value added → Life cycle cost = price of products = value added over the life cycle
 - Because labour costs, taxes & subsidies, rents & profits (together = value added) are standard elements of the supply-use framework, LCC are calculated automatically along with all the other inventory results
 - Price rebound effects can be calculated from data on average or marginal consumption
- Material Flow Analysis (MFA):
 - Completeness of material balances across the economy gives insights into material flows



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Better support for alternative modelling options

Attributional and consequential modelling:

- Average versus marginal market modelling
- Allocation versus substitution (system expansion)
- The unallocated (multi-functional) unit processes are the same for both models



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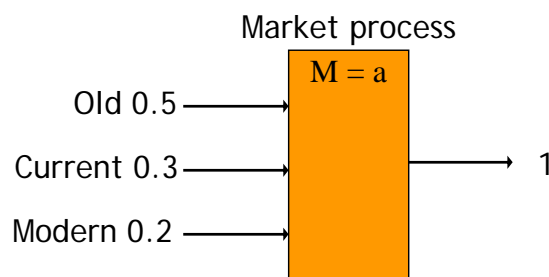
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Attributional and consequential market models



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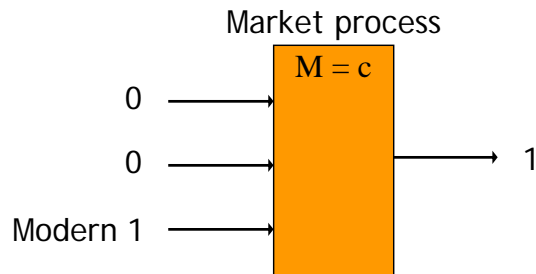
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Attributional and consequential market models



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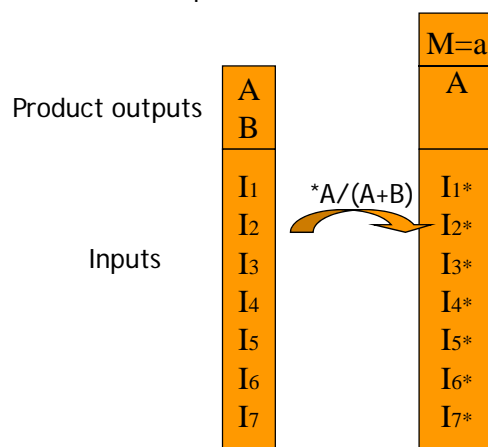
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Allocation

Multifunctional process Allocation relative to A



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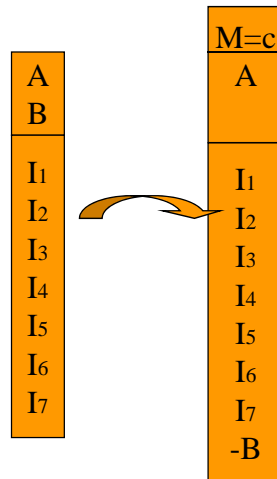
Substitution (system expansion)

Multifunctional process

Substitution relative to A

Product outputs

Inputs



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Better support for alternative modelling options

- The unallocated (multi-functional) unit processes are the same for the attributional and consequential system models
- The difference between the models lie exclusively in the market processes and the formulae applied for converting multi-functional processes to single-functional.
- By introducing a database-wide modelling parameter ("a/c"), the relevant market process and allocation formulae can be applied consistently when calculating the accumulated (cradle-gate) results.



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Thanks for your attention!



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